

Patent claims

1. Lighting system, in particular for illuminating hollow elements such as signs, inscriptions, letters, in particular relief letters and the like, comprising:

- a number of printed circuit boards provided with LEDs,
- cables for connecting the printed circuit boards to one another and/or for connecting the printed circuit boards to a voltage source,
- attachment elements for attaching the printing circuit boards to a desired location.

2. Lighting system according to Claim 1, comprising at least one transformer for transforming a mains voltage to an operating voltage of the LEDs.

3. Lighting system according to Claim 1 or 2 for lighting a surface, in particular the translucent surface of a relief letter, the LEDs being arranged on, in each case, one flat side of a printed circuit board, characterized in that the surface of the flat sides, fitted with the LEDs, of each printed circuit board is significantly smaller than the surface to be illuminated.

4. Lighting system according to one of Claims 1 to 3, characterized in that printed circuit boards of different sizes are provided.

5. Lighting system according to one of Claims 1 to 4, characterized in that each printed circuit board has at least two connecting points, each with a positive lead and

a negative lead for current, to which the cables can be connected by means of a standardized plug.

6. Lighting system according to Claim 5, characterized in that the connecting points and the plug are embodied in such a way that a plug which is connected to a connecting point protects the positive and negative leads against moisture.

7. Lighting system according to Claim 2, characterized in that the transformer is voltage-stabilized.

8. Lighting system according to Claim 2 or 7, characterized in that the transformer is protected against moisture.

9. Lighting system according to Claim 1, comprising at least one regulating module for regulating the power supply to individual printed circuit boards and/or individual LEDs on the printed circuit boards in a selective fashion.

10. Printed circuit board having a number of LEDs, in particular for a system according to Claims 1 to 9, characterized in that the LEDs have an irradiation angle of more than 150° , preferably 175° to 180° .

11. Printed circuit board according to Claim 10, characterized in that the LEDs are mounted on the printed circuit board using the chip-on-board method.

12. Printed circuit board according to Claim 11, characterized in that each LED is provided with a translucent, lens-like coating.

13. Printed circuit board according to Claim 11 or 12, characterized in that each LED has a power between approximately 0.04 and 0.12 Watts.

14. Printed circuit board according to one of Claims 10 to 13, characterized in that at least one protective resistor is provided to protect the LEDs.

15. Printed circuit board according to Claim 14, characterized in that a number of LEDs, preferably 2 to 4 LEDs, are connected in series with one protective resistor in each case on each printed circuit board.

16. Printed circuit board according to one of Claims 11 to 15, all the LEDs being arranged on one flat side of the printed circuit board, characterized in that none of the components protruding from the flat side are arranged on the flat side on which the LEDs are arranged.

17. Printed circuit board according to one of Claims 10 to 16, characterized in that the flat side on which the LEDs are arranged is constructed so as to reflect light, and is in particular white or mirror-coated.

18. Printed circuit board according to one of Claims 10 to 17, characterized in that the printed circuit board is equipped in a weather-resistant fashion, in particular

with a coating which protects the conductor tracks and the LEDs against moisture.

19. Printed circuit board according to one of Claims 10 to 18, characterized in that all the LEDs provided on the printed circuit board irradiate light of the same color.

20. Printed circuit board according to one of Claims 10 to 19, characterized in that LEDs are arranged on the printed circuit board in each case in groups of three located close to one another, a group of three being made up of LEDs with three different colors which are suitable for additive color mixing.

21. Printed circuit board according to one of Claims 10 to 20, characterized in that three LEDs are arranged in a straight line on the printed circuit board, the distance between two adjacent LEDs being approximately 14 to 20 mm.

22. Printed circuit board according to Claim 21, characterized in that the printed circuit board is approximately 50 to 60 mm long, approximately 8 to 16 mm wide and approximately 1 to 3 mm thick.

23. Printed circuit board according to one of Claims 10 to 20, characterized in that six LEDs are arranged in a straight line on the printed circuit board, the distance between two adjacent LEDs being approximately 14 to 20 mm.

24. Printed circuit board according to Claim 23, characterized in that the printed circuit board is

approximately 90 to 120 mm long, approximately 8 to 16 mm wide and approximately 1 to 3 mm thick.

25. Printed circuit board according to one of Claims 10 to 20, characterized in that nine LEDs are arranged offset from one another in a zigzag shape on two straight lines on the printed circuit board, the distance between the two lines being approximately 25 to 35 mm and the distance between two adjacent LEDs arranged on a line being approximately 30 to 40 mm.

26. Printed circuit board according to Claim 25, characterized in that the printed circuit board is approximately 140 to 160 mm long, approximately 32 to 42 mm wide and approximately 1 to 3 mm thick.

27. Printed circuit board according to one of Claims 10 to 27, characterized in that an opening for an attachment element for attaching the printed circuit board is provided.

28. Printed circuit board according to one of Claims 10 to 27, characterized in that at least two connecting points each with a positive lead and a negative lead for current are provided, each connecting point being designed for the connection of standardized plugs.

29. Printed circuit board according to Claim 28, characterized in that a guide groove for guiding a plug is provided in the vicinity of each connecting point.

30. Printed circuit board according to Claim 28 or 29, characterized in that a corresponding element which is at least partially complementary to a latching element of a plug, in particular a mounting opening, is provided in the vicinity of each connecting point.

31. Plug for a system according to one of Claims 1 to 10, characterized in that the plug is designed in such a way that a plug which is connected to a connecting point of a printed circuit board protects the positive and negative leads against moisture.

32. Plug for a system according to one of Claims 1 to 10, characterized in that the plug has a latching element which, after the plug has been fitted onto a printed circuit board, latches with a corresponding element provided for that purpose on the printed circuit boards.

33. Attachment element for a system according to one of Claims 1 to 10, characterized in that a self-adhesive film is provided on one flat side of the attachment element.

34. Attachment element for a system according to one of Claims 1 to 10, characterized in that at least one bearing surface for a printed circuit board and a mounting element which latches to the printed circuit board and presses the printed circuit board against the bearing surface are provided.

35. Power supply unit for a system according to one of Claims 1 to 10, characterized in that a DEAD-OFF module

is provided which terminates the life of the power supply unit if overheating by a predefined limiting value occurs.

36. Power supply unit for a system according to one of Claims 1 to 10, characterized in that it is vacuum sealed and suitable for external use.

37. Solar module for a system according to one of Claims 1 to 10, characterized in that a buffer battery and a voltage monitor are provided.

38. Control module for a system according to one of Claims 1 to 10, characterized in that the lighting system is automatically switched on or off when predefinable peripheral conditions occur, for example times or brightness levels.

39. Regulating module for a system according to one of Claims 1 to 10, characterized in that it is designed for the selective regulation of the power supply of individual printed circuit boards and/or individual LEDs on the printed circuit boards.

40. Sign, inscription, letter, in particular relief letter with illumination means, characterized in that the illumination is powered by means of a system or parts of a system according to one of Claims 1 to 39.

41. Use of a system of parts of a system according to one of Claims 1 to 39 for illuminating a sign, inscription or a letter, in particular a relief letter.

42. Lighting method, in particular for illuminating hollow elements such as signs, inscriptions, letters, in particular relief letters and the like, characterized in that a number of printed circuit boards provided with LEDs are connected to one another and/or to a voltage source by means of cables, and in that the printed circuit boards are attached to a desired location by means of attachment elements.

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